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ABSTRACT

The effectiveness of directionality training in alleviating a tendency to reverse letters and/or words was tested with 24 children (ages 8-9 years) with reading and math problems, who had such tendencies. The strategies used to teach directionality were based upon strategies used in previous studies with younger children that resulted in a reduction or alleviation of reversals. These strategies included such things as identifying circles, squares, triangles, and rectangles in all positions; labeling body parts as pointing left or right; and matching two words with the same beginning or ending letter. It was found, among other things, that the directionality training did not significantly affect the number of reversals made by the Ss, suggesting that using directionality training techniques with children over the age of 7 years may not be effective in alleviating the reversal tendency. However, while the experimental group continued to reverse letters and/or words even after training, they did make fewer errors on the posttest than the control group did. (DLS)

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THE EFFECTS OF DIRECTIONALITY TRAINING ON REVERSALS IN READING AND WRITING

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For over fifty years the tendency of children to reverse letters and/or words when they read has received a significant amount of attention in education (Orton, 1937; Jeffrey, 1958; Hendrickson and Muehl, 1962; Caldwell and Hall, 1965; Tawney, 1972; Koenigsberg, 1973; Moyer and Newcomer, 1977). Interest in the reversal phenomena is attributed to the concept that reversals are a primary characteristic of a serious reading problem (Ajuriaguerra, Antonini, Bessen, Biotel, Duvernay, Maguard, Menthonnes, Roth and Anahlen, 1968; Bryant, 1973). Reversals are often included as a characteristic of "dyslexia" or reading disability.

Some authors recognize reversals as normal behavior in five and six year old children (Davidson, 1935; Ilg and Amer, 1950; Gibson, Pick and Osser, 1962). However, the reversal tendency is expected to disappear without special remediation during the first or second grade, according to Wilson and Fleming (1938). If the reversals do not disappear at the appropriate time, reading problems often appear. Nevertheless, no cause and effect relationship has been established.

Numerous investigators have concluded, however, that the tendency to reverse letters and/or words is not caused by a perceptual deficit reflecting impaired neurological processes or developmental deficits (Jeffrey, 1958; Caldwell and Hall, 1965; Hendrickson and Muehl, 1962 and Koenigsberg, 1973). Rather, these investigators espouse the

premise that reversals are related to the concept that children are unfamiliar with the discrimination tasks required in correctly recognizing letters and/or words. To be able to do discrimination tasks successfully a child must have directionality training. According to Newcomer "such children may not have learned the importance of directionality as a distinguishing feature" (p. 428, 1977).

The subjects used in the previous studies which supported the concept of directionality training to improve skills in recognizing letters were in the age ranges of three years six months to six years eleven months. The investigators of this study carried the inquiry further by hypothesizing that directionality training would alleviate the tendency of older children to reverse letters and/or words. In an effort to determine the effects of directionality training, the authors used a sample of older children in the age range of eight years one month to nine years two months. It was postulated that the older children still reversed letters and/or words because they did not attend to direction factors; therefore training in directionality skills would lead to a diminished number of reversals.

METHOD

Subjects

Fifty-three children who were enrolled in a summer school remedial reading or math program were screened for a tendency to reverse letters and/or words. The children were chosen for the study on the basis of the number of reversals on the pre-test. A total of

13 boys and 11 girls were selected for the study.

Procedure

All children were administered a criterion-referenced test composed of five questions developed by the authors. The test utilized various target letters and letter sequences that are said to be confused most frequently by children with reading problems (Dunn-Rankin, 1968; Popp, 1964). The children were given numerous opportunities to confuse such letters as b, d, p, m, n, w, g, and q. Students receiving a score of 37 or below were randomly assigned to either the control or treatment group.

Group one received the remedial reading and/or math program used during summer school and 15 minutes of working time each day with the researchers. Group two received 15 minutes of directionality training each day in addition to the remedial reading and/or math program. All of the children were organized into groups of four for instruction. At the end of four weeks the children in each group were administered the same criterion-referenced test as a post-test measure.

Directionality Training Activities:

A direct teach-reteach approach was used. The lessons were followed by an independent activity which required the child to use the skill taught in the lesson. Based upon this system the researchers were able to evaluate on a daily basis whether or not a child had applied the concept independently. If a child were having difficulty s/he would receive a reteach lesson. If a child correctly applied the

concept, s/he would move on to a new concept.

The strategies used to teach directionality were based upon the strategies used in previous studies with younger children that resulted in a reduction or alleviation of reversals. The concepts covered were:

1) identify circle, square, triangle, rectangle in all positions
2) label body parts as pointing left or right; match body parts
3) label arrows; match arrows; identify a different arrow
4) identify letters pointing left or right; match stimulus letter from 2 choices
5) use clay, felt, sand, chalkboard, pencil and paper to write letters from observation, oral directions, and delayed matching.
6) find the letter shown on a card from various sets; find a letter from verbal instructions from a set
7) identify a word with the beginning or ending letter the teacher showed or stated
8) match two words with the same beginning or ending letter
9) match alike words using a verbal or nonverbal stimulus
10) identify the different word in a set
11) underline designated letter in a certain color

Results

An analysis of covariance was conducted to assess effects of directionality training on the number of letter and/or word reversals children make using the pretest as the covariate. The dependent measure was the post test score adjusted for the covariate. The independent variable was the directionality training the experimental group received each day. The results were nonsignificant ($F = (1, 21)$, 1.123, p .15), however, an inspection of the results shows that the difference was in the appropriate direction. The post test scores unadjusted and adjusted means are presented in Table 1.

Table 1 - Posttest scores

Groups	N	Adjusted Means	Unadjusted Means
Control	12	3.75	3.61
Experimental	12	2.59	2.73

DISCUSSION

The results of the study revealed that the directionality training did not significantly affect the number of reversals made by children over seven years of age. The experimental group continued to reverse letters/words even after training which gave attention to the directional factors in reading. However, the experimental group did make fewer errors on the posttest than the control group did.

The results of the study suggest that using directionality training techniques with children over the age of seven years may not be effective in alleviating the reversal tendency. According to Money (1966) children develop perceptual rules. It is possible that by the time children celebrate their seventh birthday they have constructed perceptual rules which are not as amenable to training as they were before reaching their seventh birthday. Moyer and Newcomer (1977) state "the ability to discriminate letter orientation is primarily a learned cognitive behavior and not a developmental perceptual law." The results of this study indicate that

perhaps directionality training is not a way to teach "learned cognitive behavior" or that this must be taught at a different stage of development. Further, research is needed to establish the efficacy of directionality training with children over seven years of age.

Previous research has indicated that with proper instruction, children could improve their ability to discriminate among symbols (Koenigsberg, 1973). Others have found that the performance of children to discriminate can be improved upon either by brief training or by a chance in the nature of the task (Caldwell and Hall, 1969; Hendrickson and Muehl, 1962; Jeffrey, 1958; Montessori, 1964; Wohlwill and Weiner, 1964). These studies all dealt with children under the age of seven years. Our study attempted to use similar strategies with children who were older. However, the results of our study indicated that directionality training did not work as effectively with an older age group.

Further research is needed before a decision to use directionality training with older children is made. Perhaps older children can be trained to reverse less or not at all if the training period is longer than fifteen minutes each day and the entire training term is longer than four weeks.

Another factor which might have contributed to the nonsignificant results is that the test may need to be more sensitive to the abilities of children to use directionality factors when reading and/or writing. Also, since the exact strategies used in this study (our strategies were based on similar strategies that were used in studies where the results

indicated the reversal tendency had been alleviated or lessened for teaching directionality training have not been used with children under the age of seven years, it would be inaccurate to state that our strategies are successful with the younger age group. The study should be replicated with the younger age group to insure that the strategies are successful.

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